



KranTeknisk
Forening

KTF Standard
**SAFE USE OF
LIFTING
EQUIPMENT**
in land-based industry, building and
construction



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Foreword

This KTF-standard has been developed by KTF in cooperation with members to safeguard the fulfilment of safety requirements and to establish good practice for the use of lifting equipment in land based industry, the building and construction industry. The intention is also that this KTF-standard will take care of complying with the authority's requirements.

The KTF standard is based on recognized international standards, with additional regulations that are considered necessary to fulfil unified requirements of Norwegian industry, building and construction. These KTF standards will be sent to Standards Norway in the hope that the standards can form the basis for the preparation for a national standard within the area of safe use of lifting equipment for land-based industrial building and the construction industry.

Annex A, B, C, D, E, F, G, I, J, K and L are normative. Annex H is informative.

Introduction

The purpose of these standards is to safeguard the health, environment and safety of users of lifting appliances and lifting gear.

The standards will contribute to establishing, maintaining and further developing an acceptable safety level for personnel, environment and material values in the planning and execution of lifting operations.

During the preparation of this standard, we have taken into account Norwegian legal regulations, European and international standards, the industry's specifications and procedures regarding the safe use of lifting appliances and lifting gear.

Where this standard does not cover activities to be carried out, reference is made to the standards referred to in the reference list or other recognized norms.

The standards are revised and updated regularly. The latest valid version is the one available in an electronic version on KTF's website www.ktf.no.



Scope

These KTF standards encompass the safe use of lifting equipment associated with lifting operations in industry, building and construction. This does not cover the use of elevators and fall protection equipment. Examples of lifting equipment covered by these standards are shown in Annex H, Examples of lifting equipment.

1 Normative and informative references

The following standards include provisions and guidelines which, through reference in this text, constitute provisions and guidelines of this KTF standards. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet the requirements of the referenced standards.

1.1 Normative references

When an EN standard covers the same usage area as an ISO standard referred to, the EN standard takes precedence over the ISO standard.

Acts

Working Environment

Act

Valid regulations

Reg.no.	Dec.no.	
1355	701	Organisation, Management and Employee Participation
1356	702	The Workplace Regulations
1357	703	Regulations concerning the Performance of Work, use of work equipment and related technical requirement
1359	705	Regulations concerning the construction, design and production of work equipment and chemicals.
1360	706	Regulations concerning administrative arrangements within the area of application of the Working Environment Act.
544	522	Machinery
1127	544	Regulations relating to Systematic Health, Environmental and Safety Activities in Enterprises
1028	599	Regulations concerning safety, health and working environment at construction sites

NS- standards

NS-5516 Terminology Crane types (ISO 4306-1:2007)

NS-EN standards

NS-EN 12077-2:1998+A1:2008.	Cranes safety –Limiting and indicating devices
NS-EN 12644-1:2001+A1:2008.	Cranes - Information for use and testing - Instructions
NS-EN 12644-2:2000+A1:2008.	Cranes - Information for use and testing - Marking
NS-EN 12999:2011	Cranes - Loader cranes
NS-EN 13000: 2010.	Cranes - Mobile cranes
NS-EN 13001-1:2004+A1:2009.	Cranes - General design - General principles and requirements
NS-EN 13001-2:2011	Cranes - General design - Load effects
NS-EN 13135-1:2003+A1:2010.	Cranes - Design - Equipment specifications – electrotechnical equipment
NS-EN 13135-2:2004+A1:2010	Cranes - Design - Specification for non-electrotechnical equipment



NS-EN 13155:2003+A2:2009 Cranes - Safety - Non-fixed load lifting attachment
NS-EN 13157:2004+A1:2009 Cranes - Safety - Hand powered lifting equipment
NS-EN 13557:2003+A2:2008 Cranes – Control and control stations
NS-EN 13586:2004+A1:2008 Cranes – Access
NS-EN 14439:2006+A2:2009 Cranes – Safety – Tower Cranes
NS-EN 14492-2:2006+A1:2009 Cranes - power driven winches and hoists. Part 2 Power driven hoists
NS-EN 15011:2011. Cranes – Bridge and gantry cranes

NS-EN- ISO-standards

NS-EN ISO 12100:2010 Machinery safety – Main principles for construction – Risk assessment
NS-EN-ISO/IEC 17020:2004 General requirements for the operation of the various bodies that carry out inspections

ISO-standards

ISO 4306:2010. Cranes – Wire ropes – Care and maintenance, inspection and discard
ISO 4310:2009 Cranes – Test Code and Procedures
ISO 4309:2010 Cranes – Wire ropes – Code of Practice for Examination and Discard
ISO 12478-1:1997 Cranes – Maintenance manual
ISO 12480-1:1997 Cranes – Safe use
ISO 12482:2014 Cranes – Monitoring for crane design working period
ISO 9927-1:2009 Cranes – Inspection – General
ISO 9926-1:1990 Cranes – Training of drivers. Part 1 – General



2 Definitions and abbreviations

2.1 Definitions

Words and expressions not defined here will be assumed to have been defined in regulations and international codes and standards that are referred to in this document.

2.1.1 Should

The form of the verb used to indicate that among several possibilities, there is one that is recommended as being particularly suited, without mentioning or excluding other, or that a certain course of action is preferred, but is not necessarily obligatory.

The term «should» means that other solutions apart from the one recommended in the standards may be chosen. It must be documented however that the alternative solution provides an equivalent safety level.

2.1.2 Can

The form of the verb used to indicate possibilities and capabilities, whether these are material, physical or random.

2.1.3 Must

The form of the verb used to indicate requirement to be strictly adhered to for compliance with the standards. No deviation is allowed unless this is accepted by all parties.

This form of the verb is used in connection with requirements that must be fulfilled in order to comply with these standards. If other solutions are required, this deviation is treated in accordance with company requirements. The alternative solution, along with any compensatory measures, will produce an equivalent safety level.

2.1.4 Materials management plan

Plan for the movement of loads which ensures that it is done in a safe and effective manner

The materials management plan takes into account amongst other considerations

- *the need for type and amount of lifting and transport equipment*
- *the need for loading and unloading areas*
- *preparation for the use of lifting and stacking trucks for goods, trollies etc.*
- *access to all areas and workplaces for operations and maintenance*

2.1.5 Lifting operation

All activities before, during and after a load is moved and until the lifting equipment is ready for a new load.

2.1.6 Critical lifting operations

Lifting operation requiring special safety measures to ensure safe execution for this and adjoining work operations. Operations include, but are not limited to

- load lifting over critical areas such as process equipment or areas with a common thoroughfare
- personnel transport with lifting equipment that is intended for lifting people
- coordinated lifts
- blind lifts
- lifts of special loads such as structures with a wide span and/or special design
- heavy lifts not considered to be routine operations
- lifting in strong wind, or lifting of loads with a large windbreak
- lift operations with dismantling of constructions and equipment



2.1.7 Blind lift

Lifting operation where the crane driver has not direct sight of the load, hook attachment or landing place

2.1.8 Heavy lift

Lifting of heavy loads not to be considered as routine operations.

2.1.9 Coordinated lift

Lift carried out with two or several separate lift appliances.

2.1.10 Dismantling lift

Lifting of units that load the crane when the unit is released from the base/attachment structure. This means that when the crane takes over the load, it can't be put back down.

2.1.11 Personal lift

Lift for employees with a basket or platform suitable for lifting of persons.

2.1.12 Lifting appliances

An assembled unit that is used for lifting a load with or without horizontal movement.

Examples of lift appliances are given in Annex H

2.1.13 Simple lifting devices

Cranes, winches, hoists and other lifting devices where the employer has risk-assessed their use and concluded that there is no risk of injury to life or health.

2.1.14 Crane

Lifting device where the load in addition to the vertical movement may be led horizontally in one or more directions

2.1.15 Mini-crane

Crane with a lifting capacity of less than 10 ts with hydraulic operation of the crane, which may have a combustion engine or electrical operation.

Mini-crane can move using belts or wheels, have a crane arm which can be fixed or telescopic, can have stabilizers or other equipment to maintain stability.

2.1.16 Multi machines

Multi machines are basic machines that can be fitted with different equipment that change the machine's capabilities. A typical example of this kind of machine is a telescope truck-mounted crane that may also be used for personal lifts, earth-moving machines and as cranes.

2.1.17 Lifting device

Components or equipment used between the lifting appliances and the load or on the load to grip this, but which are not an integrated part of the appliance or load.

Examples of lifting device are given in Annex H

2.1.18 Lift components

Parts for building or used as part of lifting device including hooks, shackles, rings and coupling loops.



2.1.19 Spreader beam

A construction that will maintain its desired shape or load angles of lifting gear during a lifting operation. A spreader beam is normally a construction built of beams, pipes, rectangular tubing or other suitable profiles of steel or aluminium. A spreader beam may take different forms, from being a part of the lifting device (such as a spreader in a container crane) suspended directly on a crane hook, suspended in a sling (providing for vertical load lifting points) and/or a yoke used to divide the load between the cranes.

A spreader beam suspended on a crane hook (gives increased height), and spreader bar for coordinated lifts, (avoiding uneven pull on the crane) the load will be borne by the structures and dimensioned for this.

2.1.20 Spreader bar

Spreaders are used so that vertical parts reach the lifting point or to avoid crushing the load. The construction of a spreader mainly absorbs pressure forces from the suspension device and the suspension points and is given the appropriate dimensions for the weight of the load.

2.1.21 Load container (lifting device)

All types of containers, boxes, baskets, freight containers (except standard ISO containers), gas cylinder racks, wheel barrows, etc. which are fitted with lifting lugs for use/handling with a crane.

2.1.22 Pulley block

A lifting device consisting of at least one disc in a frame, with an attachment point for rope, steel wire or chain that can be attached to a fixed point on the load

2.1.23 Fixed attachment point for lifting device

Lifting lugs, foundations for winches and moveable Cranes, lifting beams and beams for temporary suspension of beam clamps

2.1.24 WLL (Working Load Limit)

Largest permitted working load

For lifting appliances: WLL is actual hook load that the lifting appliance is designed to lift in each operation set-up

For lifting device: WLL is the maximum permitted load that a lifting device can be subjected to under normal use. For multipart lifting device this is labelled for load angle 45 degrees.

2.1.25 SWL (Safe Working Load)

Greatest permitted working load is being phased out for land-based equipment but for ships still has the following definition:

For lifting appliances: SWL is actual hook load that the lifting appliance is designed to lift in a given operating condition

For lifting device: SWL is the maximum permitted load that a lifting device can be subjected to under normal use. For a multipart lifting device this is labelled for a load angle of 30 degrees.

NB! SWL is normally used by ILO and applies to all floating and other mobile installations and ships that are not covered by EU regulations.



2.1.26 Documented training

Training where it can be documented that a person who is to operate lifting and transport equipment has received practical and theoretical training that produces knowledge about assembly, servicing, user qualities and capabilities, as well as maintenance and control in accordance with the requirements placed for safe use and service in the regulations and instructions for use. We refer to §10-1 and §10-2 of the Regulations concerning the Performance of Work.

2.1.27 Certified safety training

Training provided by a certified training company. Reference is made to §10-3 in Regulations concerning the Performance of Work

2.1.28 Before-and-after use check

Visual check of technical condition without dismantling. For lifting devices, a functionality test of all movements and safety systems must be carried out before and after use.

2.1.29 Inspection

Visual inspection carried out by a competent person to certify that the equipment is free of faults and complies with requirements as well as being constructed, placed on foundations, mounted, set up, tested and documented and maintained in such a way that it is completely defensible to use.

This is a great deal more comprehensive than a quick review, but does not usual require dismantling.

2.1.30 Expert inspection

Inspection carried out by an enterprise of competence to verify that the lifting equipment is free of faults, fulfils the relevant requirements as well as ensuring that it is constructed, placed on foundations, installed, set up, tested, documented and maintained in such a way that it is completely defensible to use.

There are 4 types of expert inspection:

- *first inspection*
- *assembly inspection*
- *periodic inspection*
- *special inspection*

Reporting of expert inspections carried out is done in accordance with Appendix I.

2.1.31 Enterprise of competence

A company certified by a certifying body to carry out inspection of work equipment as referred to in the Regulations concerning the Performance of Work, §13-1 and §13-3.

2.1.32 Inspector

Person employed in an enterprise of competence and approved by the discipline leader for inspection of the relevant working equipment,

See Regulations concerning administrative arrangements, §8-6.

2.1.33 Certificate

Formula based on ILOs recommendation, issued by an enterprise of competence, which confirms that the lifting equipment fulfils the authorities' requirements and are designed, placed on secure foundations, installed, set up, tested, documented in such a way that it is completely safe to use the lifting equipment.

2.1.34 Declaration of conformity

Declaration of conformity shall declare which regulatory requirements underpin the production/manufacture of a product. Declaration of conformity shall also state which standards – norms are applied.

For requirements for the content in the declaration of conformity for lifting equipment, see the machinery regulations Annex 2.



2.2 Abbreviations

CE	Conformité European (CE marking confirming compliance with the basic requirements in EU directives)
NS-EN	European Standard that is established as a Norwegian Standard
ISO	International Standard Organisation
ILO	International Labour Organisation
SJA	Safe Job Analysis
SWL	Safe Working Load
WLL	Working Load Limit

2.3 Revision of the standard

The standards are revised when necessary such as when there are major changes in the overarching or associated regulations.



3 Safe use of lifting equipment

This chapter describes the individual lifting operations and how those involved must carry them out. The description is independent of the type of lifting equipment that is to be used. The following chapters contain additional requirements applying to the different types of lifting equipment.

3.1 Overall requirements

- All use, maintenance, storage, checks, inspection and examination of lifting equipment shall comply with the applicable laws, regulations, standards and the manufacturers user instructions.
- Lifting equipment must only be used by personnel who have and can document recognized expertise for the actual equipment. The norms for training are in Annex B.
- The responsibility for employers and personnel involved in lifting operations are described in Annex A regarding roles and responsibility.

3.2 Management

- The assigned responsible person for lifting operations will lead the combined activities related to the lifting devices
- The crane driver usually manages the individual lifting operation.
- When it is considered to be safer, another person apart from the crane driver may be appointed to lead the lifting operation. This may be the signaller.

3.3 Risk assessment

Use of risk assessment in relation to Annex G, will be assessed for all lifting operations.

- All involved personnel will assess the need for a "pre-job-conversation", the safe-job-analysis or use of other risk analytical methods described in Annex G regarding the use of risk assessment.
- If conditions or preconditions underpinning the risk assessment are changed during the execution of a lifting operation, the operation will be stopped and the assessment redone.

For lifting equipment, there must be plans for alternative escape routes for crane drivers in case of accidents and or injury or illness.

3.4 Planning

Each lifting operation shall be planned in order to ensure safe execution and that all predictable risks are taken into consideration. The planning shall be carried out by personnel who have the relevant competence. For repeated or routine operations, such planning is only necessary the first time, provided that an operating procedure is in place or documented in another way. Periodic revisions shall be carried out to ensure that no critical factors have changed.

The planning of lifting operations shall, as a minimum, ensure that:

- basic conditions must be mapped out and assessed carefully before setting up lifting equipment. For example, cranes are not to be set up in culvert, manhole covers, docks, concrete slabs or in places that may lead to damage to the foundations and lifting equipment without it being assessed and documented.
- sufficient personnel are present in all phases of the lifting operation,
- the outgoing shift will inform the incoming shift about ongoing and planned work which is of significance for the further lifting operation (outgoing shift will also inform of any incidents),
- the lifting route will be clarified and any obstacles will be removed before lifting,
- prepare blocking plans so that barriers are in place to prevent personnel from walking or standing under suspended load



- communications form is completed,
- lifting operations can be carried out safely in relation to other simultaneous operations
- lift appliances and lifting gear are suitable and planned for use in compliance with the producer's instruction. It must be assessed whether the lifting equipment has sufficient capacity in all phases of the lifting operation.
- landing area for the load is of sufficient size and dimensioned for the weight of the load,
- use of tag line is considered,
- involved personnel must have adequate competence and knowledge of the regulations and standards governing the operation to be carried out,
- Plan free escape routes for the person attaching the load and any signaller.

3.5 Limitations

The crane driver shall map and consider limitations that can affect the lifting operation, including the capacity of the lifting equipment, wind and weather conditions, movements, landing areas, blind zones and other limitations as a result of the travel path.

In general, the wind limitations of the crane shall be adhered to. The weight, area and shape of the load, and the position of the crane shall be considered when setting wind limitations during the planning/SJA of the lift

3.6 User check

User of lifting equipment shall check the lifting equipment and make sure that it is in a safe condition before and after use.

The pre-use and post-use checks should include the following:

- visual check of the lifting device and lifting equipment
- function test of the equipment in accordance with the manufacturer's recommendations
- function test of the emergency stop device
- report any faults and defects to the technical manager

Daily check routines of the lifting equipment can cover this user check requirement.

Lifting appliances shall not be used if safety systems or parts of safety systems are not functioning or have been isolated.

3.7 Signalling to cranes / communication

Command words for radio communication and hand signals to be used during lifting operations are stated in Annex E:

- The form of communication to be used must be agreed as part of the "pre-job-conversation" or SJA.
- There must always be adequate communication between all personnel involved in the lifting operation. When the crane driver can see the load and the signaller/slinger, the use of hand signals will be sufficient, if no other instructions have been given or agreed upon.
- Radio equipment suited to the actual lifting operation is to be used. Use of mobile telephones with hands-free may in certain cases be assessed as an alternative to use of radio.
- Radio communications system must be tested before the start of the lifting operation.
- All spoken directions are to be made clearly.
- In order to avoid misunderstandings, communication related to lifting operations can be confirmed. By this we mean that the desired crane movement is indicated by the signaller and the order is confirmed by the crane driver.
- In order to help the crane driver, the desired crane movement can be stated in metres.
- Where appropriate, a system where a signaller gives a continuous signal to continue the movement can be used. The crane driver shall stop immediately if he does not get this signal.



- Unnecessary use of the radio shall be avoided.
- When radio communication is used for signalling, the driver's cabin/control centre should be equipped with a device which connects the send button without the driver having to remove his hands from the control levers.
- All unnecessary noise or activity that could disturb the crane driver must be avoided.
- If nothing else is agreed, communication must be in Norwegian. All personnel involved must have mastery of the chosen language.
- When the load is not visible, the requirements for blind operations apply, see 3.8.3.
- The crane driver will at any given time have all his attention focused on the lifting operation.

3.8 Safe execution

3.8.1 Fundamental safety requirements

- The load and any load carrier shall be properly secured and prepared before the lifting operation starts.
- For lifting of loose materials that are unsuitable for slinging, a load carrier must be used, constructed in a manner that ensures the material cannot fall out during the lifting operation.
- Necessary cordoning off the area must be carried out before the lifting operation is commenced.
- Loads must not be moved over the heads of personnel.
- Personnel must not walk under a hanging load.
- All personnel who are involved in the lifting operation shall ensure that they have an unrestricted escape route in all phases of the operation.
- Loads shall be attached to the lifting appliance and handled in such a way that the load remains stable throughout the entire lifting operation.
- The lifting operation shall cease immediately if safety is jeopardized, when instructions are unclear, or in the event of loss of communication
- The crane driver must only act on signals from a designated signaller, but must act on an emergency stop signal at all times, regardless of who gives this signal.
- The crane driver must not leave the driver's cabin or the driver's seat with a load hanging on the hook.
- If a pulley is used between the lifting device hook and the load in order to adjust the load in connection with attachment or detachment tasks, it must be ensured that the pulley does not carry a load when the lifting device is in motion. This applies to dynamic auxiliary loads such as arise from lifting movement and moving the boom up and down.
- If the assumptions that planning and risk assessment were based on changes during the operation, the requirement for new risk assessment must be considered any corrective safety measures required must be implemented.

3.8.2 Signaller and slinger

- Everyone involved in a lifting operation must know at all times who the signaller is.
- Personnel involved in lifting operations and other roles can be given visibility by wearing special outfits, such as special high-visibility vest, helmets, etc.
- The signaller and slinger must be positioned in a safe area during all movement of crane and/or lifting wire.
- If the crane driver has good visual command of the area, the signaller can carry out the slinger's duties (as described in annex A). In such cases the signaller, on agreement with the crane driver, must be in contact with the load when it is under control, and guide the free hook to and from the load or the load carrier.

3.8.3 Blind operations

- Blind operations require at least two people (the signaller and slinger) who must be able to see the load and each other and have radio contact with the crane driver. Any cameras monitoring the work area



should be considered as aids and do not replace said persons.

- The operation must be planned and completed so that there are always signallers who can give a manual signal to the crane driver in case of radio loss.

3.8.4 Lifting operation through recesses, hatches and in chutes

- For lifting operations through recesses, hatches and in chutes the requirements for blind operations apply, cf. chapter 3.8.3 Blind operations.
- When lifting through several levels an SJA must be carried out. One must especially consider the risk of the load or load carrier getting caught in obstacles.

3.8.5 Use of guidance rope (tag line)

- The crane driver will take part in assessing and approving the use of a tag line
- The rope will be secured against fraying at the end, but knots will not be used in that part of the rope
- Tag line should be used to keep control of the load, not to gain control of a load
- If there is a requirement for several guidance ropes, this may involve personnel in the operation who are not slingers. An SJA must then be carried out and the personnel must have received training related to the use of tag lines.

3.8.6 Transport of scaffolding materials and planks

- Wherever practicably possible, scaffolding material and planks should be transported in a special load carrier.
- In case of moving materials where load carriers cannot be used, strapping must be used to secure against slippage, or, alternatively lifting straps will have two turns of lashing around the load. Lashing during transportation of the load should be done from the same side.

3.8.7 Dangerous goods

- Dangerous goods must be stored and handled in accordance with the datasheet, labelling on containers and local procedures.

3.8.8 Coordinated lift

- A risk assessment and preparation of an SJA must always be done in advance of coordinated lift operations. These must include detailed planning and a designated responsible manager. See Annex K.

3.8.9 Dismantling lift

- There must be a special assessment of any dismantling lift without a retreat opportunity after the load is transferred to the lifting device and a risk assessment must always be carried out and an SJA prepared in advance of such operations. For this type of operation, the load's centre of gravity and the weight must be assessed precisely. Watch out for conditions that can contribute to increasing the load's weight such as water, snow and ice etc.

3.8.10 Conclusion and assessment

- Any undesired incidents that took place during the lifting operation must be reported.
- After the lifting operation is concluded, those involved must assess whether there is a need for experience exchange or improvement of current procedures.



4 Person lifting with Cranes

4.1 General requirements

Personal lifting is the lifting of people using work equipment.

Regulations concerning the Performance of Work §18-8 states:

" Only work equipment and platforms designed for lifting persons shall be used to lift employees. Work equipment that is not designed for lifting persons may be used for the purpose by way of exception. When such work equipment is occupied by an employee, the control station shall be manned continuously. The employee being lifted shall have reliable means of communication and the possibility of being safely evacuated."

This regulation applies to all companies that undertake lifting of personnel with work equipment. The employer is responsible for ensuring that the rules are adhered to.

4.2 Person lift with cranes intended and approved for the purpose

Personal lifting shall preferably be carried out with equipment that is designed and approved for the lifting of people. Whether it is designed for lifting of people is stated in the crane's user instructions and declaration of conformity. If the equipment is thus designed, you are free to lift people as long as the equipment is inspected and found safe to use and those operating the equipment have the necessary training. Planning and risk assessment is a natural part of all lifting operations.

4.3 Lifting of people in exceptional circumstances

Cranes are not intended for the lifting of people, but can, in exceptional circumstances, be used for the lifting of people if the work to be carried out is low-risk and of short duration. This may include changing light bulbs as well as uncomplicated and short-term painting, cleaning and assembly tasks etc.

Work equipment (such as cranes and baskets) used for lifting in exceptional circumstances must fulfil the requirements of the regulations concerning the Performance of Work, §18-7.

A written assessment must be carried out justifying why approved equipment is not being used for the lifting operation in question. A risk assessment will be carried out that uncovers possible risk concerning the work operation concerned and those who took part in the risk assessment must be documented.

In the context of risk assessment, there must be written plans and measures showing how the individual tasks may be executed safely at the actual site, a safe job analysis (SJA). These will at any given time be available where this work is being carried out. There must be documentation regarding the participants in the lifting operation

4.4 Repeated lift of people with cranes that are not intended for lifting people

If repeated lifts will be carried out with Cranes that are not designed and approved as person lifts and it cannot be classified as an exception, dispensation must be sought from the Norwegian Labour Inspection Authority before the lifting operation can be carried out. It must be documented why equipment designed and approved as person lifts cannot be used.

For more information on such application, see: <http://www.arbeidstilsynet.no/fakta.html?tid=96679>



5 Additional requirements for lifting equipment

5.1 Use of cranes

- Slingers and signallers must have the necessary, documented training
- There will be safe communication between the crane driver and signaller/slinger.
- Special care must be taken of electrical wires and other obstructions.
- Cranes must not be used near electrical wiring. See Annex J.
- In order to avoid obstacles such as electrical wiring, busy areas, public thoroughfares and other areas where load routing is to be avoided, it is recommended that working area limits are set up for the crane.
- Cranes that are set up and used outdoors at a height above 15 m (30 m in built-up areas) must be marked with lights in darkness. Otherwise, see Annex J reporting obstructions to aviation
- Cranes can only be used for lifting. Pulling and pushing of loads is not permitted.
- Use of cranes outdoors must be stopped during thunder.
- Use of cranes outdoors must be stopped at wind speeds greater than those permitted by the manufacturer, and if the nature of the load makes lifting in winds risky.
- When carrying out coordinated lifts between cranes, a risk assessment must be carried out and guidelines regarding coordinated lifts must be taken into account, in accordance with annex K.
- Cranes must not be left with the load suspended from the hook.
- If cranes are fitted with extra equipment such as vacuum lifters, magnetic lifters and grabs, documented training for this equipment must be carried out.
- When carrying out inspections and work on cranes where there is not regular access and there is potential for falling to a lower level, a person lift or appropriate fall safety equipment should be used if possible.

5.2 Mobile cranes – mobile harbour crane

General

- The crane driver must have certified safety training and a crane driver certificate G1 for mobile cranes.
- The crane driver must, in addition to certified training, have completed appliance specific/ type and workplace training for the crane in question.

Positioning and use

- During transport on road and construction sites, the crane must be correctly rigged and secured and be transported in accordance with the crane's user manual
- Access routes for mobile harbour cranes and mobile cranes must have sufficient load carrying capacity, width and height (electric wires)
- Positioning site must be able to withstand the cranes point pressure from the pads (NOTE! Cable dikes, manhole covers, culverts, pontoons, slopes and concrete decking.)
- The crane must be positioned and made ready for use in accordance with the user manual.
- Extra pads must be used when necessary regarding the load carrying capacity of the surface.
- Pre-use inspection must be carried out. For cranes requiring extensive rigging a mounting inspection must also be performed before use.
- The crane driver must ensure that the load securing system is correctly programmed in relation to the crane configuration.
- The crane driver must stop driving when the wind speed exceeds the limitation stated in the crane's user instruction or the load's weight and size prevent secure handling.



5.3 Tower crane

In general

- The crane driver must have specified safety training and crane driver's certificate G2 for tower cranes.
- The crane driver must in addition to the certified training, have completed appliance specific/type and workplace training on the actual crane.
- Before set-up, the basic conditions must be inspected and the permitted ground pressure must be stated.
- Foundations and crane rail must be executed in accordance with the manufacturer's instructions, and must be documented and confirmed.
- Tower cranes shall be earthed through the main cable. The crane should also be earthed to the building's concrete reinforcements and in accordance with the user instruction.
- There must be safe access to the driver's cabin, for access higher the 3th floor or 20 metres, the installation of a lift for crane drivers is recommended.
- The crane driver must be able to evacuate the crane cabin in a safe manner.

Use

- The crane must be set up in accordance with the crane's user manual
- A pre- use inspection must be carried out in relation to the checklist bases on the crane's user instruction and internal company guidelines.
- When moving along tracks, the crane driver must have a full view of the crane path and be sure that it is free of obstacles. If there isn't oversight of the entire crane path, the crane driver can use a signaller on the ground.
- If several cranes are operating in the same area, at different heights but entering into each other's radius, an instruction schedule for the cranes work limits and/or an anti-collision system must be prepared.
- The crane driver must suspend driving when the wind speed exceeds the limit in the crane's user instruction or when the load's weight or scope prevents safe load handling.

After use

- Tower cranes must swing freely in the wind. Be vigilant of the trolley and hook position with regard to any obstructions.
- When the crane is out of service, it must be locked and secured against unauthorised use.
- Cranes on rail tracks must be fixed to the tracks with clamps.

Addition for self-erecting cranes

- When assembling self-erecting cranes, the manufacturer's assembly instruction must be followed.
- An assembly inspection must be carried out after moving/assembly
- When transporting self-erecting tower cranes, the jib must be secured mechanically before transport

5.4 Portal-/jib crane and container crane

In general

- The crane driver must have certified safety training and crane driver certificate G3 portal/jib crane.
- The crane driver must, in addition to certified training, have completed appliance-specific/type and workplace training on the actual crane
- The crane driver must have a secure escape and evacuation route.



Use

- Pre-use inspection must be carried out in accordance with checklist based on the crane's user instruction and the company's internal regulations.
- When moving along tracks the crane driver must have a complete visual view of the crane path and ensure that it is free of obstacles. If he hasn't got an overview of the entire crane path, the crane driver can use a signaller on the ground.
- The crane driver must suspend driving when the wind speed exceeds the limit in the crane's instructions for use or when the load's weight or scope prevents safe load handling.

After use

- The crane must be parked in accordance with the user instructions for the crane and the company's guidelines as well as being secured against unauthorized use.
- The crane must be secured on the tracks before it's left.

5.5 Traverse cranes

Generally

- The crane driver must have a certified safety training and crane driver certificate G4 bridge and traverse crane as well as documented appliance-specific/type training in the actual crane. Alternatively, where the employer has risk-assessed the use and concluded that there is not a risk of damage to life or health, the training may be given as documented safety training.
- If the crane has special equipment available such as for example, vacuum litters and magnetic lifters, documented safety training on this equipment must be carried out.
- If the traverse crane is placed in an area with oversight and there is no blind driving, the crane driver can carry out a lifting operation alone by taking care of the tasks of the slinger and signaller.
- A traverse crane driver who is driving a radio-controlled crane must have eye contact with the crane and load. If this cannot be done, the guidelines in chapter 3.8.3 must be adhered to.
- Radio-/remote-controlled traverse cranes shall have clear marking of operations panel and the crane belonging to it. This is especially important where there are several cranes in the same building/ hall. Such controls must be lockable or protected against unauthorised use of a code. If there is a spare transmitter, it must be stored in such a manner that the crane driver is not at risk of taking the wrong transmitter or that both transmitters are used at the same time.
- Where there is more than one crane on the crane runway or more than one trolley per crane, there must be collision protection.
Active collision protection may be avoided if the movement energy is low and the nature of the load does not require it.
- In case of several cranes on the same runway, a service breaker per crane will be installed. Common mains switch for supply.
- Automatic or semi-automatic cranes must have a device that stops it functioning if a person or a vehicle enters the work area inadvertently.
- When coordinating/interoperating (cover switch A+B) of several hoist trolleys on the same crane, a control system is recommended where all safety appliances affect all hoists.
- Marking of lifting capacity/-ies must emerge clearly from marking of both sides of the crane bridge / traverse, well visible from the control place. This is especially important when it applies to the correct use of several trolleys on the same crane bridge/ traverse (WLL Main lift, assistance lift and coordinated lift).



Use

- Pre-use inspection must be carried out in accordance with checklist based on the crane's user instruction and the company's internal regulations.
- The crane driver must have a good overview of the lifting area and know the obstructions.
- The crane driver must at all time keep his distance from the load, on account of the risk of being crushed.
- A crane with the possibility of being controlled from several places (for example radio and operating panel) must be set up so that only one control station is active. This does not apply to emergency stops.
- A crane with a fixed operating position/cabin must have evacuation possibilities throughout the entire operations area.

After use

- The crane must be parked in accordance with the user instructions for the crane and the company's guidelines as well as being secured against unauthorized use.

5.6 Loader cranes

General

- The crane driver for loader cranes over 2 ton/metres must have certified safety training and a crane driver certificate G8 for loader cranes.
- For loader cranes under 2 ton/metres documented safety training is required.
- The crane driver must in addition have documented appliance-specific type training on the actual crane.
- Console-mounted or other quick-connect cranes must be correctly locked to the vehicle.
- In case of transport on road, the crane must be correctly secured/encased, e.g. so that the crane arm cannot swing out.

Installation and use

- Stabilizers must be extended, lowered and locked in accordance with the user instruction. Check the surface and the pads. Use extra pads when necessary.
- The crane must be placed horizontally for full stability.
- The crane must be unpacked in accordance with the user instruction.
- The crane must be used within the turning radius and the maximum load indicated in the load diagram. Be particularly cautious when using manual extenders.
- Be particularly aware of electric wires and other obstacles.
- The crane must only be used for lifting. Pulling and pushing of load is not allowed.
- Wind can restrict the crane's working area (windbreak of the object to be lifted)
- Hydraulic winches must be suited to the crane's overload protection system, up/down stop and motion sensor switch.
- The winch must only be used in accordance with the crane's user instructions.

5.7 Fixed installed hydraulic crane

In general

- The crane driver must have documented training and a crane driver certificate G20. Alternative certified safety training and a crane driver certificate G8.
- The crane driver must in addition have documented appliance-specific type training on the actual crane.
- Hydraulic winches must be adapted to the crane's capacity and overload protection system.
- Wind can restrict the crane's working area (windbreak of the object being lifted).



5.8 Work winch

- The operator must have documented appliance-specific type training on the actual type of equipment.
- Attachment must be documented in accordance with the capacity of the winch.
- When using a working winch, safety zones must be cordoned off to avoid injuries caused by breakage of the hoisting rope.
- During use the operator of the working winch must ensure that the hoisting rope is correctly wound and doesn't build up causing risk of falling load.
- The operator of the working winch must never use their hands to guide the hoisting rope onto the drum while it is moving.
- Refer to 3.8.3 for requirements for blind operations, for use of block, see 6.20.

5.9 Manual pulleys

- For suspension of pulleys. See section 7: Fixed attachment points and suspension points.
- Never use greater force on the handle/chain than what is stated in the user instruction. This will normally be between 20 kg to 50 kg.
- The pulley chain must not be used as a lifting strap around the load.
- The pulley hooks are strongest when the load is at the bottom and gets weaker towards the tip of the hook.
- Ensure that the load chain is free of twists, this is especially important for pulleys with two or more parts.
- First lift the load just above the ground, or where it is, to ensure that the brakes can hold it.

5.10 Mini-cranes

General

- Requirements to the driver of mini-crane manufactured in accordance with EN 13000:
 - From 2009 (cf. committee report from the Norwegian Labour Inspection Authority)
 - From 0 to 2 ton inclusive – Documented training
 - From 2 to 10 ton inclusive – G8 driving licence (certified training)
 - Over 10 tm – G 1 mobile, the crane driver licence (certified training)
- The crane driver must in addition have documented appliance-specific type training on the actual crane and additional equipment, such as vacuum lifters, magnet lifters and grabs.
- The access route for mini-cranes must have sufficient load carrying capacity, width and height.
- The positioning site must be able to withstand the cranes point pressure from the stabilizers (NOTE! Cable dikes, manhole covers, culverts, slopes, pontoons, concrete decking and floors).
- Stabilizers must be extended, descended and locked in accordance with the user instructions. Extra padding must be used when necessary according to the load carrying capacity of the surface.
- The crane must be "unpacked" and positioned according to the user instruction.
- Be especially aware of electric wires and other obstacles.
- The crane must only be used for lifting. Pulling and pushing of loads is not allowed.
- When carrying out joint lifts (see annex K), a risk assessment must be carried out first in accordance with Annex G.
- The crane driver must ensure that the overload protection system is correctly programmed.



5.11 Multi-purpose machinery

- Drivers of multi-purpose machines must have gone through the training required for base machine
- The driver must in addition have documented appliance-specific/type training on the additional equipment that is used.
- Permitted areas of use and which limits that apply must be stated clearly in the instructions.
- If the multi machine is used as a crane, the relevant parts of this standard apply.



6 Additional requirements for different lifting gear

6.1 Use of lifting gear

- Users of lifting gear must have completed documented training. This means that the employer must provide specific training in all lifting gear that the personnel will use in their work.
- People who shall sling loads and direct cranes must have gone through documented slinger and signaller training.
- The employer is responsible for the training covering the specific slinger tasks to be carried out.
- Signaller/slinger must along with the crane driver, ensure that the working area is secured so that personnel who do not take part in the lifting operation are not injured. The materials management plan, establishing fixed secured load routes, cordoned-off areas, temporary cordoning off will be actual measures to be taken.

6.2 Procedures before use, after use and storage of lifting gear

- In order to ensure a good overview of loose lifting gear that is not in service, the company should establish set procedures for storage including the storage of gear in set places and a system so that there are no mix-ups and incorrect equipment is not chosen.
- Lifting gear must be protected against the weather and other damaging effects during storage.
- Large pieces of equipment such as spreaders, beam spreaders, control pendants, load carriers and so on must if it is practicably possible be protected against damaging effects during storage.
- Lifting gear must before and after use be inspected in respect of correct marking, possible overloading, wear and tear or damage.
- The user must bring loose lifting gear back to the storage place after use.
- Defective and damaged lifting gear must be marked or made unusable and should be collected at a definite place. A collection place for defective and damaged gear must be clearly marked.
- Activities which have a great deal of lifting gear should establish their own procedures for in and outward delivery of lifting gear to executing personnel, as well as carrying out a procedure for checking equipment before new outward delivery. A qualified person must carry out these checks.

6.3 About the use of lifting gear generally

- The load must always be connected to the crane hook using suitable lifting gear.
- When using lifting gear made of chain, steel rope or fibre, the lifting capacity will be calculated in relation to the number of legs, load angle, slinger method and other factors that change the gear's capacity
- When the lift is calculated in accordance with a table for symmetrical lifts, the load is divided almost equally between the parts.
- Use of more than two individual parts in the crane hook makes poor load division between the parts. Use two shackles in the crane hook as a lifting head in order to split the load better between the parts.
- A lift is defined as asymmetrical when the load angles are unequal and have a difference of more than 15° out from the vertical line.
- The strap must be tightened/force applied with care and not jerked.
- Always try to use lifting gear and a slinger method which you are sure prevents the load or parts of the load from falling down.
- U-lifting should normally be avoided as the load will be loose in the straps and may slip out in contact with obstacles.
- Lashing is considered to be a good method for attaching the load to the hook, but lifting capacity is reduced by 20%.



- When lashing loads consisting of several units, the strap is put “twice around” the load, alternatively cargo lashings may be used to ensure that parts do not slip out.
- Place lashing from the same side of the load when lashing pipes, steel reinforcement bars, materials etc. This means the load is kept together better and twisting is avoided.
- Individual items can be lashed from each side, if the load can withstand torsion forces.
- Pallet should preferably be lifted with lifting forks to prevent the pallet from being damaged when lifted. The load should be secured on the pallet and placed on the forks so they point slightly upwards. Normally the pallet/load should be secured to the lifting forks unless a risk assessment has been done that shows there is no risk to life or health in connection with the lifting operation.
- If goods have to be lifted on pallets only with straps it must be ensured that the pallet does not get damaged or breaks. Pallet and goods must be secured to the lifting device with lashed straps. Ensure that the lashed straps do not damage or displace the load on the pallet. When lifting pallets with frames, a plate/frame or empty pallet should be used as a lid on the pallet frame to avoid damage to or displacing of frames so that goods fall. When lids and frames are secured with load lashings single hitch can be used.
- All loads must be placed on grit/surface so that the load doesn't rest on the lifting gear when landed. This is to make it easy to pull them out and avoid them getting squeezed or damaged.
- The surface must be able to hold the weight of the load and the load must be stable when the crane is offloaded.

6.4 Lifting gear made of fibre

- Consider the fibre strap's adverse properties with respect to chemicals, heat, cutting damages, etc.
- Protection must be used between the straps and any sharp edges of the load.
- The fibre strap's contact radius must comply with the manufacturer's instructions. A sleeve can be placed on the shackle pin to increase the diameter.
- When fibre straps or slings used in the same loop or hook, they must not be on top of each other.
- When shorting smaller fibre straps only recognized shortening hitches must be used and it must be ensured that any unused parts of straps cannot get caught on obstacles during lifting. A so-called “Englishman” is not allowed.
- When shortening and splicing fibre straps the lifting capacity should be reduced, as for lashing, by 20%.
- Using knots that are hard to loosen are not allowed for splicing and shortening.
- When using fibre straps connected to steel components only component intended for that use should be used. Refer to the manufacturer's recommended contact radius.

6.5 Chain slings

- When using a chain sling the parts should be gathered up when driving the crane without a load. This is to avoid the slinger getting injured by swinging chains when grabbing the sling without a load. Tie a half hitch with one of the chains around the other. Avoid joins that can get caught on obstructions.
- Avoid twisting of the master link and the chain legs during use.
- Avoid sideways forces on the hook when lashing. This is when the hook is laying on an edge or when lashing around small diameters.



- Hooks must always take the load at the bottom, not on the tip. Use hooks of a size that fits the lifting point.
- When lashing a sling with large load angle, the opening of the hook should face away from the sling's vertical line.
- Ensure that the shortening hooks/ claws/ mechanisms and lashing hooks with sliding loops are used in accordance with the manufacturers user instructions.
- When chains are joined by mechanical joining devices, the pre-use inspection must also focus on corrosion and mobility in the join. Mechanical joining devices must be lubricated.

6.6 Lifting device of steel wire rope

- Choose straps made of steel wire rope and a design that is suitable for the actual use, with respect to flexibility, core material, terminal attachments, etc.
- To maximise the load carrying capacity of a steel wire strap in a U shape, the diameter the strap goes around (the contact radius) must be at least 6 times the diameter of the steel wire rope. If the contact radius is the same as the diameter of the steel rope then the strength is reduced by 50%.
- Be aware if lifting is performed with just one steel wire rope the load can rotate a lot during the lifting operation.
- Pinched steel wire or wire with kinks must not be used, kinks are caused by loads where the wire rope goes around a sharp edge.
- Discard steel wire straps with one or more broken threads if they need to be handled by personnel, even if they are within the acceptance criteria for broken threads. Protruding threads can cause injury to people.
- Steel wire straps with corrosion must not be used since pitting corrosion can lead to breakage or reduction in strength.
- Steel wire straps with ferrule-secured eyes normally have a maximum working temperature of 100°C.
- Be aware that corrosion and wear and tear attack ferrules, such as when straps are dragged along concrete floors, asphalt, etc.
- To keep a lashed bundle with steel wire straps together during storage, a special clamp made for the purpose can be used.

6.7 Wire rope clamps

- Clamps for steel wire ropes shall normally not be used in lifting gear.
- For other use the manufacturer's user instructions must be followed.

6.8 Shackles

- When using shackles, it is preferable to use shackles with rotating pin/nut bolt with cotter pin.
- The shackle's WLL is estimated from the load between the shackle loop and the pin.
Shackles have reduced capacity sideways and some also are reduced in the case of point load on the pin, refer to the user instructions.
- The load angle between several parts gathered in one shackle can cause reduction in the lifting capacity, see user instructions.
- When attaching a shackle to a lifting point with a pre-drilled hole for the pin, the direction of the pull on the shackle must be along the lifting point so that neither the shackle nor the lifting point experience loads sideways.
- Shackles with rotating pin should always be used in permanent suspension and when coupling equipment and the nut must be secured with a split pin of steel.
- In a simple lift with shackle, locking pins that are easier to operate can be used for extra security, such as linchpins. Hairpin cotter pins should not be used as they can be pushed out in contact with obstacles.



- If using a shackle with an eyebolt or a track bolt in the lifting setup, the bolt must be adequately secured to withstand rotating forces transferred to the shackle pin.
- When the risk of rotating forces on the shackle pin is small, other types of shackles can be used, but should only be used for "simple lifting operations", i.e. that the shackle is opened and closed fully between each lifting operation.
- For lifting of persons only shackles with double locking should be used, such as nut plus a split pin or threaded connection with a split pin. A linchpin should not be used or other locking (R clip) that can accidentally get pushed out during use.
- Shackles where the pin is only locked with a split pin (no threaded design) are not allowed.

6.9 Eyebolts, eye nuts and swivel pins

- Check that eye bolts/nuts are of a recognized type and correctly labelled.
- Check that the eye bolt/nut is not modified or damaged.
- Check that threaded bolt that the eye bolt or nut is to connect to is of similar quality, thread type and dimensions, and is free of damage.
- Correct fitting is when the eye bolt's or the nut's contact face is fastened against the surface.
- Ensure that the pull direction after installation are in accordance to the user instructions and WLL. Feel free to use eyebolts in the joint/swivel finish.
- The goods thickness of the material into which the eyebolt is screwed in must at least be the same as the bolt diameter.

6.10 Load carriers/containers

Are all types of containers, crates, basket, containers (apart from the standard ISO containers), bottle rack, wheelbarrows and the like which are equipped with lifting lugs/pad eyes for use/handling with crane.

- All containers that are made ready for and are to be handled by crane, must have been subject to a thorough inspection. Load carriers that are defined/certified as lifting gear must have been subject to inspection by a certified enterprise of competence.
- Pre-use inspection must include a check of lifting points and the load-bearing parts.
- Containers must not be lifted by crane using connection points intended for loading on trucks, only certified lifting points must be used for crane lift.
- Check the load carrier's WLL before use of the lifting points that are intended for crane lifting. WLL may be less than what the connection points for loading on trucks can take.
- Container content must be properly secured whether it is closed or open so that the load is not displaced or may fall out/down.
- Securing of the cargo in a load carrier may be carried out with fibre, and/or chain straps, lids, nets or other suitable equipment.
- When containers are being loaded or emptied with work equipment that is not run by manual power, workers must not stay in the container.
- Great care will be shown when opening doors of the load carrier in case there are objects that can fall out. Look out for potential falling objects. Check that there is nothing loose in the load carrier before it is lifted. Look out for dropped tools and equipment, stones etc on the stringers and the forklift pockets.
- ISO containers, even if these are not defined as lifting gear, must be inspected before the lift. Weak points are corrosion and/or rot stains in the bottom, corroded and/or damaged doors/hinges or locking mechanisms. The ISO standard says that the loaded ISO containers that must be lifted without a special spreader, must be lifted using a spreader across and straps attached at the bottom with ISO lifting fittings. This is to ensure that the container is not crushed or deformed/or does not collapse.



- Containers are lifted either with a special spreader attached in ISO corners of container or by using a spreader, i.e. pad eyes fitted in the corners of the bottom of the container and the spreader is attached to these.
- Lifting of ISO-containers must not be mixed with offshore-containers as offshore-containers are lifted from the top with a 4-part sling.

6.11 Lifting of gas bottles

- When lifting gas bottles always use a load carrier or another lifting device designed for the purpose.
- The gas bottles must not be lifted from the "targa bar".
- On gas bottles where the pressure gauges are not an integrated part of the bottle, they should be detached before the lift.

6.12 Big bags

- Big bags for multiple uses must have documentation.
- By single use is meant transport from manufacturer via supplier to the user.
- Pre-use inspection must always be carried out
- Big bags must not be stored without cover because the fibres deteriorate in sunshine over time.
- User instructions states requirements to how the bag can be attached to the lifting hook in terms of load angles, etc.

6.13 Clamps (plate clamps/beam clamps)

- Ensure that the clamps are adapted to the objects to be lifted.
- Pre-use inspection must be carried out, look especially for skewness, damaged plaster surfaces, tightening mechanisms with threaded spindle for beam clamps and plate clamps.
- The user instructions denote applications and limitations for use to take into account when using clamps.

6.14 Claw/grabber

- Must be used for the purpose it was designed for, see user instruction.
- A pre-use inspection must be carried out with specially focus on the locking/closing mechanism.

6.15 Vacuum lifters

- Pre-use inspection and use must be carried out in accordance with the user instructions.
- Ensure that the vacuum lifter is adapted to the purpose and the surface to be lifted.
- Check the pads/seals that they are complete and free of damage.
- Check warning system if fitted.

6.16 Lifting magnet

- Pre-use inspection and use must be carried out in accordance with the user instructions.
- The surfaces/edges of the load and the lifting magnet must be clean and free of particles and damage.
- First lift the load a little bit to ensure that the device can hold it.



6.17 Lifting bell, lifting nipples and lifting caps

- Check that the equipment has the right capacity in relation to what is being lifted. Check that the lifting track/lifting pin is not cracked or deformed.
- This type of lifting equipment must be certified and approved before lifting, including dedicated instructions for use.
- Before use always check that the threaded part of the lifting bell, nipple, cap and the load are free of damage.
Also check that the equipment is correctly fitted, and that the thread size and type correspond. A similar check applies when using a different coupling mechanism, such as inspection of intervention mechanism and grip flanges, etc.

6.18 Lifting beams/spreaders

- Get to know and adhere to the lifting beam's user instruction
- Check the marking of the lifting beam and any lifting instructions
- Check that the top attachment (suspension device) of the spreader bar has the right dimensions in relation to the weight of the load and the load angle
- Check that the spreader is correctly assembled and that all screws, bolts and pins are fitted.
- Ensure that spreader frames are not loaded so that they become warped
- Avoid load angles between the spreader and the load, since this can cause adverse torsional forces in the spreader.
- Ensure that shackles and hooks are connected and loaded correctly.

6.19 Hoist trolleys

- Hoist trolleys must be used as described in the manufacturer's user instruction.
- Ensure that the trolley's width and wheel profile is correct in relation to the beam's profile and width. Ensure that the hoist trolley is correctly adjusted and fitted.
- When using hoist trolley on a beam there must always be end stoppers.
- Hoist trolleys must not be subject to sideways loads apart from what the instructions allow.

6.20 Single and multi-sheave blocks

- There must be a document available that confirms that the suspension point is approved and is able to withstand the forces to which it can be subjected.
- For complicated setups an enterprise of competence must verify the estimates of resultant forces and suspension.
- The block must be placed such that the rope can run freely and not chafe against the side edges. Check that the locking and security systems are correctly fitted.

6.21 Turnbuckles

- If turnbuckles are used in the lifting arrangement, they must be certified and approved for lifting.
- Ensure that forks/bolts and threaded section are not damaged.



7 Fixed attachment points and suspension points for lifting equipment

7.1 Attachment point on a component or equipment that shall be lifted

- These are lifting points on a component or a piece of equipment that will hold its own weight, when these points are a part of the construction. (For example, lifting lugs on a truck that will hold it, or lifting points on a piece of machinery or construction)
- Correct use of the lifting points shall be described in the manufacturer's user instruction or otherwise documented.
- There are no requirements for certification of such lifting points, but lifting points on machinery must be clearly and permanently labelled.
- Pre- and post-inspection of such lifting points must be carried out.
- Lifting points that cannot be considered an integral part of the unit to be lifted, are to be considered as lifting gear and must be certified and receive periodic inspection from an enterprise of competence.

7.2 Fixed attachment points/tracks for lifting device

- Before a fixed attachment point for a lifting device is used for the first time, an enterprise of competence must issue documentation that it is ready for use (authorised initial inspection).
- Welded lifting lugs in the structure, lifting beam, encased in a sleeve in concrete, suspension of lifting equipment in elevator chute, etc. are considered to be fixed attachment points.
- Documentation for casting / grouting / gluing must be available. The manufacturer's assembly instructions must be followed.
- NDT and/or visual inspection with load test must be used as a basis for approval of attachment point.
- All fixed attachment points for load must be of appropriate dimensions, tested and clearly labelled with WLL and ID-no.
- Any restrictions on use of fixed attachment points must be specified in the documentation and be readable at the actual attachment point or be advertised to the user in other ways. Lateral load is not allowed unless described in the user instruction.
- Pre- and post-inspection of attachment point must always be carried out.
- Periodic inspection by an enterprise of competence must be carried out when the attachment point is used regularly, for infrequent use periodic inspection by an enterprise of competence can be omitted, until the attachment point is brought into use again.
- When a beam clamp is used as a suspension point (example: pulley suspension when rigging), a document must be presented that confirms that the suspension point (the beam) can take the actual force and any other strain the hoist may apply. There are normally consultant engineers within different disciplines that can calculate and confirm this (suspensions in building constructions are complex).

7.3 Attachment points for pulling

- With pulling operations, the relevant parts of this standard are used as a basis for the execution, especially chapter 3.3 on risk assessment and 3.4 regarding planning.
- Strength of attachment points for pulling should be documented.
- If there is vertical movement of the load in connection with pulling, the attachment point must be underpinned by the demands in Chapter 7.2 Fixed attachment points/tracks for lifting appliance.
- There must be pre- and- post inspections of attachment points for pulling.



Annex A (Normative) Roles and responsibility

Personnel will be selected to take care of the roles that are described below. The appointment of the responsible people does not absolve the employer or the owner of the lifting equipment from the legal responsibility. The roles may be taken care of by personnel that also have other duties, and the personnel do not need to be employed in the enterprise responsible.

The responsible people will have sufficient training and experience in line with the requirements of Annex B regarding training.

Employer	The employer must ensure that the regulations stated in the Working Environment Act and the associated regulations are upheld. This must particularly include the following: - ensuring that all personnel have necessary training so that they have competence for the tasks they are assigned to. - ensure that all working equipment that is used by employers are in defensible state, inspected and certified where required. - ensure that those who are assigned tasks have sufficient authority.
Company or main company	When several activities are being carried out at the same workplace, those enterprises that are carrying out work at the same workplace, will when necessary, agree in writing about which of them will be responsible for coordinating their common activities. The Company must - ensure that all personnel have sufficient and up-to-date competence for the tasks they are assigned. - ensure that all working equipment used is in a defensible condition, inspected and certified where required. - ensure that those in responsible positions have sufficient authority. - appoint persons with technical responsibility and person(s) responsible for lifting operations, as well as coordinating common crane and lifting operations.



The person who is appointed to be responsible for lifting operations	Must - carry out overall management of lifting operations, - ensure that all lifting operations are planned satisfactorily and carried out in a safe manner and if necessary ensure that a risk assessment and safe job analysis (SJA) is done in accordance with Annex H. - ensure that lifting operations are carried out with sufficient and qualified personnel. - coordinate lifting operations in respect of the other ongoing activities. - ensure that there is enough available and suitable lifting equipment. - ensure that the lifting route/lifting area is properly secured and cordoned off if necessary. - ensure that there is sufficient information exchange between shifts - ensure compliance with this standard.
The person selected to bear technical responsibility	Must - take care of technical state of lifting equipment. - ensure that the necessary maintenance programme is established, implemented, carried out and maintained in accordance with the manufacturer's instructions and experiences with this type of equipment, see Annex F regarding maintenance. - ensure that the necessary inspections by enterprise of competence are carried out and followed up - ensure that the necessary documentation for lifting equipment is available in relation to Annex D regarding documentation and marking. - assess the need for and recommend the renewal of modifications of lifting equipment in consultation with users.



Crane driver	The crane driver is responsible for all elements in lifting operation which can perceive, see and affect. The crane driver must: - take care of the safety for the individual lift, - ensure that the necessary cordoning off of the working area is done - participate in the planning of lifting operations, see chapter 3.8, - ensure that the lifting appliances and gear are in good and usable condition and in accordance with the manufacturer's instructions, specifications and other given instructions, - carry out or ensure that maintenance is carried out in line with the programme of maintenance, - carry out a documented pre-use-inspection of the lifting appliances, - ensure that the necessary communication is established between everybody involved in the lifting operation, - operate the lifting appliances and lifting gear correctly in accordance with the manufacturer's instructions, these standards and given instructions, - abide by the instructions and signals from the signaller, and obey the stop signal no matter who gives it. - stop a lifting operation if there is any doubt about its safety. Lifting operations will not be taken up again before safety is taken care of. - not participate in lifting operations if one feels either physically or mentally unfit. - not participate in other tasks that may distract one's attention during lifting operations, - report any undesired events, faults and lacks.
Signaller	The signaller must - participate in planning of the individual lifting operation, - clearing lifting route and ensuring that the necessary cordoning off to keep personnel who are not involved in the lifting operation, outside of the exposed areas - ensuring that the slinger and other personnel are in a secured area when lifting and lowering loads, - be in visual or radio contact with the crane driver and with the slinger. - communicate in accordance with the requirements of this standard, - the signaller may also be the slinger.



Slinger	The slinger must - take part in the planning of individual lifting operations, - use suitable lifting gear for the load in accordance with the manufacturer's instructions, this standard and given instructions, - carry out pre-use-inspection of lifting gear - make sure that the load is made ready and secured properly before the lifting operation starts, - notify the signaller when the load is ready for lifting and when the hook is freed after the end of the lifting operation, - the slinger may also be the signaller.
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Annex B (Normative) Training requirements

The employer must ensure that all personnel involved in lifting operations, or with maintenance of lifting appliances and gear, are fit, competent and sufficiently trained to carry out the tasks and to take care of the area of responsibility. Competence requirements for the various roles and recognised norms for training are described in this Annex. All personnel involved in operation and maintenance of the lifting appliances and lifting gear should have the relevant apprenticeship certificates.

Personnel being trained must only be assigned to tasks that correspond with their current expertise, as assessed by their mentor and the person responsible for training.

Competence requirement

Roles	Competence requirements.
Person appointed to take responsibility for the lifting operations	Knowledge about the applicable authorities' requirements and the relevant standards. Knowledge and experience of lifting operations and ability to lead and guide involved personnel. Knowledge about methods for overseeing that lifting operations are carried out in accordance with the authorities' requirements and actual use standard. Knowledge about risks associated with lifting operations and carrying out risk assessment and performing safe job analysis (SJA)
Person appointed to take responsibility for the technical aspect	Knowledge about the applicable regulations as well as the technical demands on lifting equipment. Knowledge about the requirements for inspections performed by an enterprise of competence and the necessary documentation for the different types of lifting equipment. Knowledge about maintenance requirements and the maintenance system that is used for the lifting devices.
The crane driver	Training in accordance with recognized norms for training of crane drivers in this Annex. Knowledge about the authorities' requirements, this standard and instructions given.
Signaller / slinger	Documented training as a signaller/slinger. The duration of training should be at least 8 hours and contain both theory and practice. In accordance with the recognized norm for training, such training has a duration of 24 hours (Modules 1.1 and 2.3). Knowledge about the authorities' requirements, this standard and instructions given.
Maintenance workers	Maintenance workers should have the relevant apprenticeship certificate and the necessary training, practical experience and instruction to carry out the working tasks they are assigned.
Enterprise of competence	A company certified as an enterprise of competence by a Norwegian certifying body for inspection of lifting equipment



	The inspector must be employed by an enterprise of competence and competence-assessed for carrying out inspections in actual lifting equipment classes. See additional criteria prepared by the Coordination Committee.
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Training of crane drivers

- Requirements for training of the crane drivers are considered fulfilled when the training is carried out in accordance with the table below – a recognized form of training.
- All training that is implemented after the standard was published shall be in accordance with training plans where these have been prepared. Previous training in line with the curriculum given in the table below shall remain valid.
- Training in accordance with training plans and training modules shall be documented through certificates of competence issued by an approved national register.
- If the crane driver's certificate are issued by other national authorities one must apply to the Norwegian Labour Inspection Authority regarding Norwegian approval.



Recognised training standards – Lifting appliance operator

S = Certified safety training

D = Documented training

T = Theory course

P = Practical course

BI = Internal company practical training

Type of equipment	Certificate of competence category	Previous curricula	Today's training Modules	S/D
Slinger course	Slinger	F-2702 T/P	Module 2.3	S
Mobile crane	G 1	F-2685 T/P F-3686 T + BI	Module 2.4 T Module 3.4 P Module 4.4 BI	S
Mini-crane 0-2 tm	Documented training			D
2-10 tm	G8	F-2707 T F-2706 P	Module 2.8 T Module 3.8 B Module 4.8 BI	S
Over 10 tm	G 1	F-2685 T/P F-3686 T + BI	Module 2.4 T Module 3.4 P Module 4.4 BI	S
Tower crane	G 2	F-2695 T/P F-2696 T + BI	Module 2.5 T Module 3.5 P Module 4.5 BI	S
Portal / swing crane	G 3	F-2690 T/P F-2691 T + BI	Module 2.6 T Module 3.6 P Module 4.6 BI	S
Bridge and traverse crane	G 4	F-2693 T/P F-2694 T + BI	Module 2.7 T Module 3.7 B Module 4.7 BI	S
Loader cranes with cap. > 2 tm	G 8	F-2707 T F-2706 P	Module 2.8 T Module 3.8 B Module 4.8 BI	S
Fixed hydraulic cranes	G 20	F-3089		D
Loader cranes with cap. < 2 tm	Documented training			D
Personal lifters	Documented training	F-2699 T/P		D

Other lifting devices

Lifting appliances for which there are no recognised syllabus or training plans available, shall only be operated by personnel with documented training in accordance with the training plan developed by the company. The plan shall be based on the manufacturer's recommendations, the company's own experiences and official syllabus or training plans for the most similar types of crane.

Certified and documented training

Certified training enterprise shall be responsible for all training in according with syllabus, training modules and training plans, in accordance with requirements from the Norwegian Labour Inspectorate Authority's regulations regarding the execution of work and the Coordination Council's (*Samordningsrådet*) additional criteria. Other training must be documented.



Lifting appliances – specific training

The appliance-specific training shall include as a minimum:

Requirement for training in accordance with the user instructions for:

- technical structure, for example, hydraulics, control system etc.
- safety functions such as overload system, emergency stop, limit switches, alarms etc,
- capabilities and areas of use, limits of use
- pre-use inspection
- operation, maintenance and inspections
- relevant requirements from this standard
- communication
- installation of gear and extra equipment, including straps etc.

The training shall be carried out by trained personnel and documented by both the candidate and confirmed that the training has been completed in a satisfactory manner.

Mentor arrangement

Training of crane operators

- Training of new operators shall follow relevant syllabus/training plans and the mentor (instructor) shall fulfil any additional requirements in these.
- Mentor shall be responsible for crane driving in the training period.
- When the trainee operates the crane, he shall be under the supervision of the mentor the entire time.
- During training in the operation of the cranes, the mentor shall sit next to the trainee in the cabin until the mentor considers it safe to supervise operations from the side-lines. The mentor must at all time maintain radio contact and provide supervision for the trainee.

Maintenance of competence

All competence that is required in accordance with this annex shall be maintained. The following areas should receive particular focus in refresher training:

- applicable regulations and standards
- correction of undesired behaviour.

Maintenance of competence can be done internally in the company or through an external training company. Maintenance of competence shall be documented.



AnnexC (Normative) Requirements to local procedures

Every company must prepare the necessary local supplement to this standard which describes local requirements and procedures in accordance with this Annex. The supplement must contain as a minimum

- Which lifting devices as classified as simple.
- Competence requirement for the crane driver/user of special lifting devices not described in table B.2.
- Which roles are responsible for lifting operations and who has technical responsibility for lifting gear (connected to the job).



Annex D (Normative) Documentation and marking

Requirements to user documentation

All lifting equipment manufactured after 01.01.1995 must be accompanied by a declaration of conformity and must be CE-marked in relation to the Regulation regarding Machines order. no. 522.

All lifting equipment must be accompanied by user instructions in compliance with the Regulation regarding Machines order. no. 522.

All lifting equipment must be accompanied by a certificate from an enterprise of competence.

User instructions for each lifting appliance must be available on/or in the proximity of the device. This must contain information about use, service, maintenance, assembly, dismantling and transportation. We refer here to the requirements regarding content in the Regulation regarding Machines order. no. 522.

All lifting devices must have an updated maintenance journal.

Control book

All inspections, repairs and modifications shall be entered in a control book or on a control card. An electronic system that provides a similar overview can be used. The enterprise of competence must sign off in the control book. information shall be kept as long as the equipment is in use and be available.

Logbook

Entries are made into the logbook as necessary, dependent on use.

Completed pre-use-inspections and the results. A checklist should be prepared for the completion of pre-use-inspections. This checklist must be based on the user instructions, any experiences and employer's requirements.

Marking and labelling

Lifting equipment shall be marked in accordance with the Regulation regarding Machines reg. no. 522 and the production standard used for the individual lifting devices or lifting gear.

Where appropriate, lifting appliances can be marked with the regulations that apply for the use of the lifting appliance. The regulations can include

- competence requirements to the user
- technical and technical responsible / the equivalent for the appliance
- user inspections
- operational limits
- working area limits
- instructions for safe use
- any emergency procedures.

Capacity marking (WLL) must be legible from the driver place.

Cranes that are approved for personnel transport must be marked for this (type approved).

Marking must last for the duration of the product's lifespan.

All lifting equipment must have traceability marking.



Annex E (Normative) Signalling to cranes

Radio communication

Recommended commands using the radio

Command	Handling	Comment
Hiv / Vinsj opp	Lift load	
Lår / Vinsj ned	Lower load	
Topp bom	Raise the boom	
Legg bom	Lower boom	
Teleskop ut	Telescope out	
Teleskop in	Telescope in	
Løpekatt UT	Trolley is driven OUT, from the crane tower	Tower crane
Løpekatt INN	Trolley is driven IN, away from the crane tower	Tower crane
Sving høyre	Swing to the right, seen from the operator of the lifting device	
Sving venstre	Swing to the left, seen from the operator of the lifting device	
Stans	Stop movement immediately	
Pent/fint/rolig	Calm movement	
Slakk av	Facilitate disconnection of the hook	
Fri krok	Raise up free hook	
Hev hovedarm	Main boom is raised	Loader crane
Senk hovedarm	Main boom is lowered	Loader crane
Hev Vipparm	Outer boom is raised	Loader crane
Senk Vipparm	Outer boom is lowered	Loader crane
Jibb opp	Jib up	Loader crane
Jibb ned	Jib down	Loader crane



Hand signals

For direction of lifting operations, the following hand signals shall be used:

Use main block 	Use whip line 
Extend telescopic boom 	Retract telescopic boom 
Swing to the right/left – Driving direction 	Stop 
Raise the load  Small circles = low speed Large circles = high speed	Lower the load  Small circles = low speed Large circles = high speed



Raise the boom	Lower the boom
Movement of belts of wheel (both belts)	Emergency stop



Appendix F (Normative) Maintenance

Maintenance is a combination of all technical, administrative and managerial measures taken throughout the equipment's lifespan with the aim of re-establishing the condition of the equipment whereby it can perform the intended functions. Maintenance can include preventive activities, monitoring, inspection, testing, repair, replacement, cleaning and tidying. Maintenance shall be in accordance with the manufacturer's instructions. The maintenance programme shall focus on preventing failure in components that would result in a high risk of hazardous situations. Consideration shall also be given to the company's experiences, as well as standards for safe use of lifting appliances referred to in this standard.

Maintenance shall be developed continuously and improved continuously based on experiences made during the operation and maintenance of the equipment. Maintenance must be able to be documented.

Where appropriate, the crane driver can perform first-line maintenance on the lifting equipment he operates. This contributes to greater knowledge of and ownership in the lifting appliance.

Before carrying out maintenance on lifting appliances, a 'Do not operate' or similar warning sign shall be placed by the controls, which should preferably be locked out. The lifting appliance shall not be operated before the warning sign has been removed by the person responsible for the maintenance activity.

Before the lifting appliance is put into operation, the person responsible for the maintenance activity shall ensure that testing is carried out in accordance with the manufacturer's instructions for use, and that all safety systems are set for normal operations. After maintenance has been carried out, the crane driver must carry out a user check and ensure that the functions have been returned to normal operational status. If the scope of the maintenance is limited, it is sufficient to control the functions related to the maintenance carried out.

After maintenance has been carried out on the crane boom, the crane driver shall check the boom visually before it is raised. In particular, he shall check for loose parts, that the wire rope is laying correctly in the sheaves and that wire locks are correctly installed

Before inspections carried out by enterprise of competence and sizeable maintenance activities on complex lifting appliances such as offshore cranes, a pre-job talk shall be held by the personnel involved. If, in connection with these activities, testing is to be carried out beyond what is described in the programme, an SJA should be carried out.

The general responsibility that the crane driver has for the crane operation, also applies in connection with maintenance activities and controls carried out by enterprise of competence. If safety is called into question, the lifting appliance operator shall halt the operation.

Maintenance of lifting equipment is divided into 1st, 2nd 3rd line maintenance:

1st line maintenance:

Daily, periodic and preventative maintenance carried out by the user or crane driver in accordance with the descriptions in the user instructions

2nd line maintenance:

Minor repairs and services that do not require the enterprise of competence's approval or execution.

3rd line maintenance

Heavier maintenance, that is major services and repairs/ re-constructions that require the enterprise of competence's approval or execution



Annex G (Normative) Risk mapping

Purpose

In order to achieve safe lifting operations, it is necessary that all involved parties are aware of and can reduce the hazards inherent in the operation. In this respect, different types of risk mapping can be used, depending on the complexity of the operations to be performed.

The purpose of risk mapping is to try to identify all potential hazards under all imaginable conditions and initiate measures to reduce or eliminate these.

The different methods of risk mapping (see below) can be used for all types of lifting operations. This mapping is particularly relevant:

- if available procedures and work descriptions are inadequate,
- if the operation involves new and unpredictable risk elements,
- if it is proposed to alter equipment, develop new equipment, or assess the interaction between new solutions and the equipment already in operation,
- when ensuring that the equipment used is suitable for the purpose, and that the equipment is used correctly,
- when there is an increasing fault frequency or increased risk during certain operations.

With all risk mapping, it is particularly important to involve personnel with operational experience.

Identification of risk elements

Risk elements means all factors that directly or indirectly can influence the risk of fatality or injury, damage to the environment, or material damage or losses.

Identifying risk elements is important. If the risk elements are not identified, there will be no possibility of systematically eliminating or reducing them.

A successful identification of risk elements is based on

- Knowledge of procedures, systems, equipment and components
- Knowledge of lifting operations/use
- Knowledge of accidents
- Knowledge of undesirable events and near-miss accidents,
- Systematics and analysis methods
- Knowledge about slinging of different types of load

Methods

In order to ensure that risk mapping is carried out systematically, different methods have been developed. Here we refer to some that can be used.

Pre-job-talk

A pre-job talk is an oral review in advance of a concrete work task or operation. Everyone who is directly involved in the operation shall participate. This type of review is documented briefly by listing in keyword form the central elements that were raised and clarified in connection with the working operation. Name of participants in the pre-job-conversation are noted down.



Safe-job-analysis (SJA)

A safe job analysis is a systematic and documented review of all risk elements before a concrete work task or operation, such that measures can be initiated in order to eliminate or control the identified risk elements during the preparations for, and execution of, the work task or operation.

Risk assessment using an expert group

Risk assessment by a competence group is a systematic and documented review by means of predefined keywords, and is implemented by personnel with special competence within the relevant specialist areas.

For lifting operations, obvious group members can be the crane driver, slinger, signaller, technical manager/ equivalent, expert inspector, equipment supplier etc.

The group shall be headed by a person with sufficient competence to carry out this type of risk mapping.



Annex H (Informative) Examples of lifting equipment

Lifting appliances covered by this standard (examples)

Cranes – all types
Winches
Hoists – all types

Lifting gear covered by this standard (examples)

Lifting beams	Shackles
Blocks	Slings – fibre/chain/wire rope
Load and service containers	Slings – single/multi-leg
Baskets	Single/multi-sheave blocks
Work baskets	Swivels
Waste containers	Rings
Eye bolts / Eye nuts	Turnbuckles
Beam clamps	Concrete bucket
Hooks	Links
Wedge sockets	Pendants
Lifting fittings	

Examples of detachable lifting equipment

Typical examples of detachable lifting equipment standardised by CEN:

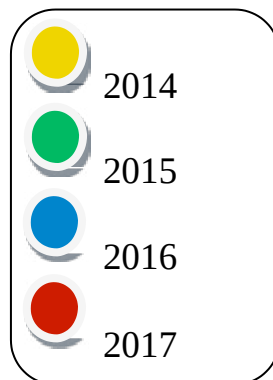
Clamps
Grabs
Timber claws
Rotators
Grabber buckets
Vacuum lifters
Lifting magnets
C-hooks
Lifting forks
Lifting beams



Annex I (Normative) Control marking after inspection by an enterprise of competence and documentation

Colour marking of completed inspection by an enterprise of competence.

Lifting appliances, lifting gear, fork lift trucks, personal lifts, suspended access equipment, mast climbing work platforms, builder's hoists and earth-moving machinery must be marked with oblate, to make visible that the legally stipulated periodic inspection (12 months) has been carried out. (Lifting gear may be marked with spray or strips with the year's marking colour.)



For marking of lifting devices, marking oblates must be used indicate the month of the inspection, as well as the month when the next inspection must be held. The name and address of the certified enterprise of competence as well as the certification body must appear on the marking on the control oblate.

White indicates that the lifting equipment must not be used.



The company that owns and/or hires in/uses equipment must ensure that the equipment is correctly marked

The company that owns and/or hires in/uses equipment subject to requirements of inspection by an enterprise of competence must ensure that such inspection is carried out.

There must be in addition to marking a report from the enterprise of competence after the inspection. Ref:
Regulations concerning the performance of work §13-1 Work equipment subject to a requirement for inspection by an enterprise of competence
Regulations concerning the performance of work §13-4 Documentation of inspection by an enterprise of competence
Regulations concerning administrative arrangements within the area of application of the Working Environment Act, area §8-7 Inspection of work equipment by an enterprise of competence

Documentation

Employer/owner must store the following documentation. It shall be presented to an authorised activity during control, as well as being able to be shown to an official authority on demand.

Document	Lifting	Lifting gear (such as chain sling, fibre sling, shackles etc.)
User instructions	X (in Norwegian)	X (in Norwegian)
declaration of conformity	X (for equipment supplied after 1.1.1995, should also be in Norwegian)	X (for equipment supplied after 1.1.1995, should also be in Norwegian)
Certificate form 3 (certificate of use)	X	NA
Certificate form 4	X (for the crane hook)	X
Certificate form 5 (wire rope certificate)	X (important when changing wire rope)	NA
Maintenance logbook	X	NA (may be relevant on complex lifting devices such as container yokes and hydraulic grabs)
Inspection report with valid approval for use	X	X

X – means that it must exist, NA – means that it is not relevant

Equipment owners must keep such documentation for the entire lifetime of the equipment and it must follow the equipment if there is change of ownership.



Annex J (Normative) Marking of aviation obstacles

Setting up and use of crane

Regulations for civil aviation (BSL) are regulations that place a responsibility and obligation on those who own and/or assemble equipment to notify the Norwegian Mapping Authority if the equipment could be defined as an obstruction to aviation. We define any buildings, construction or facility with a height of 15 metres or more above the ground or water apart from in built-up areas, and 30 metres or higher in built-up areas as an obstruction to aviation. By this definition, we also mean cranes of different constructions including mobile cranes.

Guidelines for the assembly and use of cranes with a height defined as being an obstruction to aviation.

From September 1, 2014 the previous regulations BSL E 2-1 and BSL E 2-2, were combined into one regulation [2014-07-15 no. 980 regarding the reporting, registration and marking of obstructions to aviation, BSL E 2-1](#). The new regulation states the changed demands for reporting and marking. In the new BSL E 2-1, the definition of temporary obstructions to aviation, is an aviation obstruction assembled for up to 4 weeks. There is no obligation to report these to the NRL (National Registry for Aviation Obstacles) at the Norwegian Mapping Authority, but they are to be marked with lights if they are assembled in darkness, and have a height over 15 metres or 30 metres in a built-up area.

Low-intensity obstacle light type B (32 candela, red, fixed light) must be used for marking if the obstacle remains standing in darkness. For aviation obstacles that are already marked with just 10 candela red obstacle light, the regulation demands that the owner of the obstacle changes the lights to 32 candela red hazard lights (low-intensity hazard light type B) by October 15, 2019. The lights must then also release infrared light so that the lights are visible to pilots who fly with Night Vision Goggles.

For reports of obstructions 40 metres or higher, the Norwegian Mapping Authority is obliged to immediately inform the Norwegian Aviation Authority about this as this height is more critical than the general height threshold for reporting. Regulation about reporting, registration and marking of aviation obstacle, BSL E 2-1, require that the aviation obstacle with a height of over 60 metres or more, must be marked as a rule. The regulation's §8, §15 and §16 stipulate the marking of point obstructions.

For the assembly and use of cranes, the following guidelines will contribute to ensuring the safety of airplane and helicopter traffic.

Reporting

1. All permanent obstacle to aviation (that is, cranes set up for longer than 4 weeks), must at the latest 30 days before set-up be reported to the NRL (National Registry for Aviation Obstacles) at the Norwegian Mapping Authority. A link to the reporting form is available at the Norwegian Mapping Authority and the Civil Aviation Authority of Norway websites and at the end of this document.
2. The reporting obligation also applies when an aviation obstacle must be changed, moved or torn down. This is because the electronic mapping database at the State's mapping registry must always reflect the actual up-to-date obstacle situation in the country. It is very important that the National Mapping Registry (NRL) is informed when the crane is dismantled so that the obstacle database is updated.
3. Setting up cranes for periods shorter than four weeks is defined as a temporary obstacle and there is no obligation to report to the Norwegian Mapping Authority.
4. With the use of cranes within a radius of 5 km from an airport, the airport should be notified. This can be done by making contact with the tower at the airport. Be particularly vigilant with the use of cranes in proximity of helicopter landing pads at the hospital and so on. The landing pad's owner, for example, the hospital, shall be the contact for notification.



Marking

1. Daylight:

All use of cranes, permanent or temporary, must if 60 metres high or higher be visibility marked in daylight.

They must be marked with a good visible colour on top and the extremities.

The yellow colour often used by cranes can be perceived to be a visible colour with the capability of being sufficient colour marking.

Mobile cranes should have special highly visible colour on the tip of the boom.

(Regulation BSL E 2-1, describes some colours that are normally not considered to be highly visible.)

2. In darkness:

All cranes, that remain assembled in darkness at a height of over 15 m (30 m in a built-up area), must be marked with regulation hazard lights (see Introduction). Hazard lights are installed on the top and at the extremities.

An exception, if the crane is subject to a reporting obligation to the Norwegian Mapping Authority and is not set up before the 30 day deadline for report, light marking is required when the height is 60 metres or higher.

The Civil Aviation Authority of Norway can always demand marking on cranes that are lower, if there is known helicopter traffic and/or an airport close by.

Temporary obstacles (cranes) must be marked in darkness even if they are not subject to a reporting duty to the Norwegian Mapping Authority

3. **Mobile cranes** should have installed a permanent hazard light in the boom tip, as they are often left with the boom raised.

This must be used when it is standing assembled in the darkness with the boom tip at a height of over 15 m.

4. Tower cranes should have 3 hazard lights on the top of the mast, horizontal jib and the end of the counter jib.

Cranes in use close by and not high over existing buildings or constructions can omit marking, but this must be clarified with the Civil Aviation Authority of Norway.

References:

Civil Aviation Authority Norway, 8001 Bodø, Tel.: 75 58 50 00

Contact person: Airport Section, Att. Sverre V. Kjerpeseth, Tel.: 98261881, E-mail: svk@caa.no.

Regulations:

[Regulation 2014-07-15 nr. 980 on reporting, registration and marking of obstacles to aviation \(BSL E 2-1\)](#)

Notification and registration:

National register of aviation obstacles

Norwegian Mapping Authority, 3507 Hønefoss, Tel.: 08700

Contact: Andreas Woxholtt and Tom Pettersen



Annex K (Normative) Tandem lift

K.1 In general

When planning a facility with cranes it may be pertinent to plan for using two cranes to lift the heaviest lifts, instead of building a larger crane that can lift these loads on its own.

Often the development has led to loads of a size that was not envisaged when the facility was planned. In such cases, it can be a solution to the problem may be to use two cranes in tandem instead of resorting to a more costly solution to the problem.

In Regulation concerning the performance of work, §18-5, 5th paragraph, one finds only the following about coordinated lifts: "If a load has to be lifted simultaneously by two or more units of work equipment for lifting, and the load is not guided, then routines to ensure that the operator coordinates the work in a secure manner shall be established and used".

When carrying out tandem lifts, two cranes with the same capacity should be used and block with sheave and hook, see figure K.1.

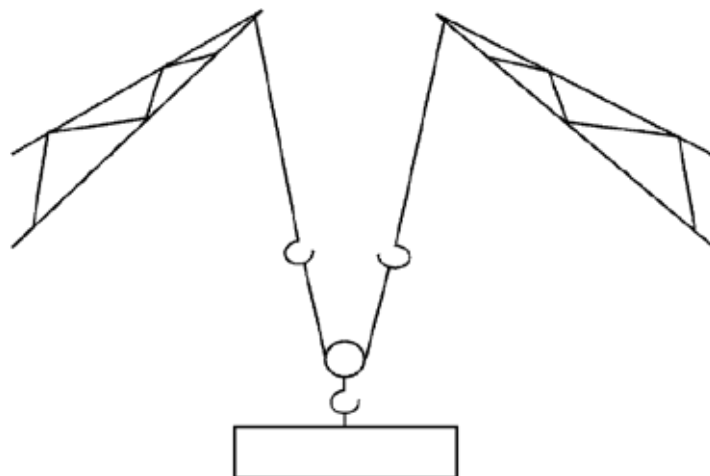


Figure K.1 – Two Cranes with the same lifting ability

In special cases, however, those in charge of cranes can allow two cranes with a different lifting ability to be used in a tandem lift.

In the case of such a tandem lift, it must be ensured that the two cranes top sheaves are not more than 3 metres apart and the cranes must be positioned so that the sideways pull is as small as possible (preferably less than 5 degrees from vertical). Special personnel must be instructed about the conditions and one of them must be used to monitor the tandem lift. In the case of cranes with the same lifting ability correspond to the permitted coordinated lift approx. 75% of the total of the crane's lifting ability.



K.2 Additional loads during tandem lifts

When the wire rope of the crane is not vertical, there will be additional strain. There will be an increased tension in the lifting wire, and there will be a force trying to overturn the crane. This is particularly relevant for the stability of cranes with outriggers, especially when they have a great height.

On the crane in Figure K.2, the overturning moment from the load increases with 30% compared to when the wire rope is vertical.

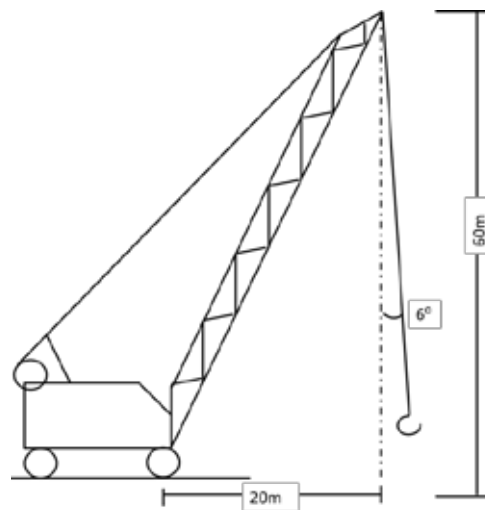


Figure K.2 – Non-vertical lifting wire

During tandem lift the lifting wires will hang slightly off vertical. The angle will be smaller, the longer the distance from block to top sheave (see figure K.3). It is therefore an advantage to lift the load as little as possible when using tandem lifts..

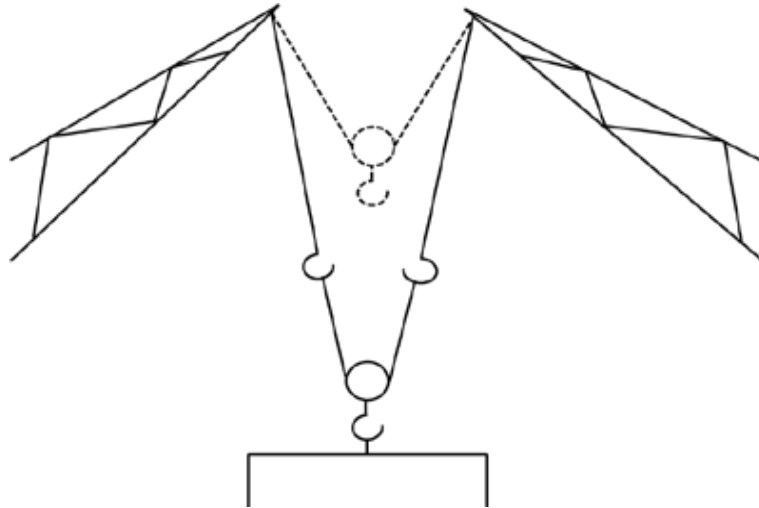


Figure K.3 – Non-vertical lifting wire during tandem lift

If two cranes are hooked independently to the load being lifted (see Figure L.5), the distribution of the load will be dependent on the position of the centre of gravity.

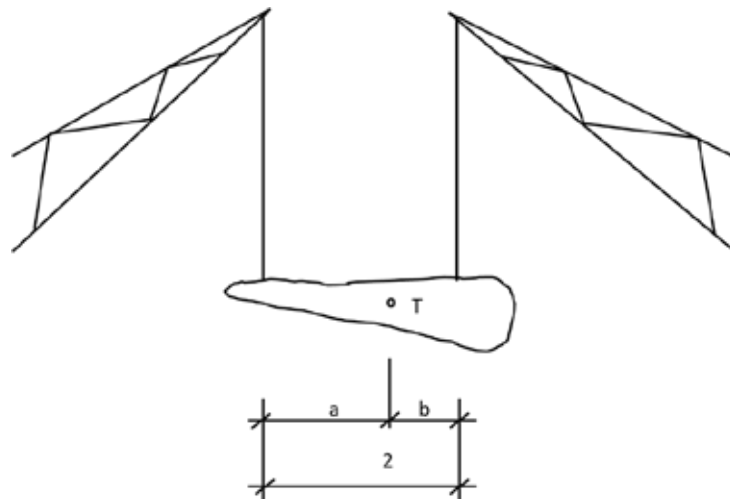


Figure K.4 – Two cranes independently hooked to the load

A wrong assessment of the position of the centre of gravity can give considerable deviation from the calculated distribution of the loads, and the error will increase significantly when the distance between the hooks is reduced.

A deviation will also occur if the hooks are lifted with different speeds, both because the wire ropes will be hanging on a slant, and because the centre of gravity will move in relation to the hooks, see Figure K.5. In the extreme case, one crane may take the whole load on its own. If this happens during lowering, it will not help that the cranes are protected by overload switches, as one crane can be given the entire load by the other crane

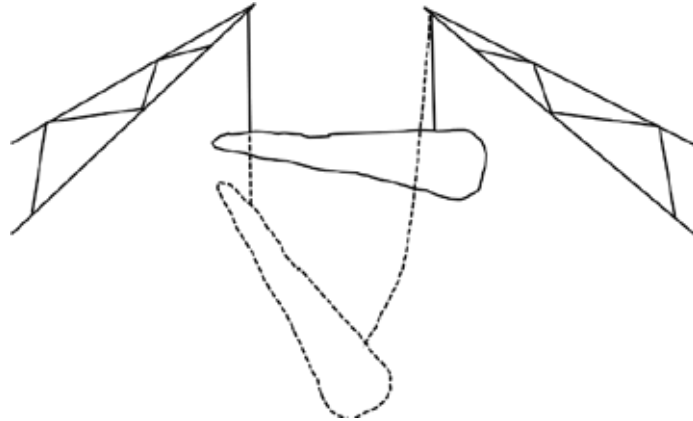


Figure K.5 – Lifting with unequal speed

K.6 Yokes

By using lifting yokes (see Figure K.6) a more reliable load distribution is achieved. It is as safe as using a block with sheave and hook (see Figure K.1), and in addition it is easier to achieve vertical wires to reduce any overturning moment.

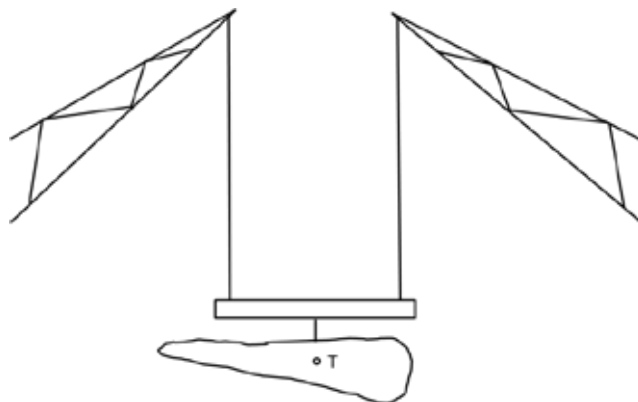


Figure K.6 – Use of yoke

K.7 Recommended loading

The Norwegian Labour Inspection Authority has no binding rules for how much the cranes can be loaded during tandem lifts, but because of the many uncertainties a reduction should be made on the maximum allowed load.

The following reductions are recommended as minimum values with the assumption that the person responsible will make further reductions when conditions make this necessary:

- tandem lifting shall usually not be used where two cranes have the hook fastened at the same point;
- when using two cranes of unequal capacity and block with sheave and hook as shown in Figure K.1, minimum 15 % reduction of ordinary SWL;
- when using two cranes of unequal capacity and “Spanish tackle” – 15 % reduction of the smaller value of:
 - 33% of the crane fastened to the end of the tackle rope,



- 2) 67% of the crane fastened to the block of the tackle.
- d) when fastening directly to the object to be lifted, it is assumed that the weight and position of the centre of gravity is determined with the best accuracy possible. Maximum allowed capacity for cranes with outriggers shall be reduced by at least 25 %. The same reduction applies to both maximum load and maximum moment,
- e) for the same arrangement as in d), but using overhead cranes, use a reduction of at least 15 %;
- f) for use of cranes with outriggers and yokes, the minimum reduction is 10 %;
- g) for use of overhead cranes and yokes, the minimum reduction is 5 %.

for all cranes with synchronised movements (tandem driving), there is no addition.

K.8 Planning and management

A tandem lift will always put great demands on both planning and management of the work. It is therefore assumed that the manager responsible makes sure all necessary investigations are carried out beforehand with determination of weights and if necessary the centre of gravity.

As important is to make sure the lift is conducted under the supervision of an experienced person who the whole time has direct contact with the crane drivers, for instance by radio. Only experienced crane drivers must be used with a thorough knowledge of the equipment to be operated.



Annex L (Normative) Electrical wiring

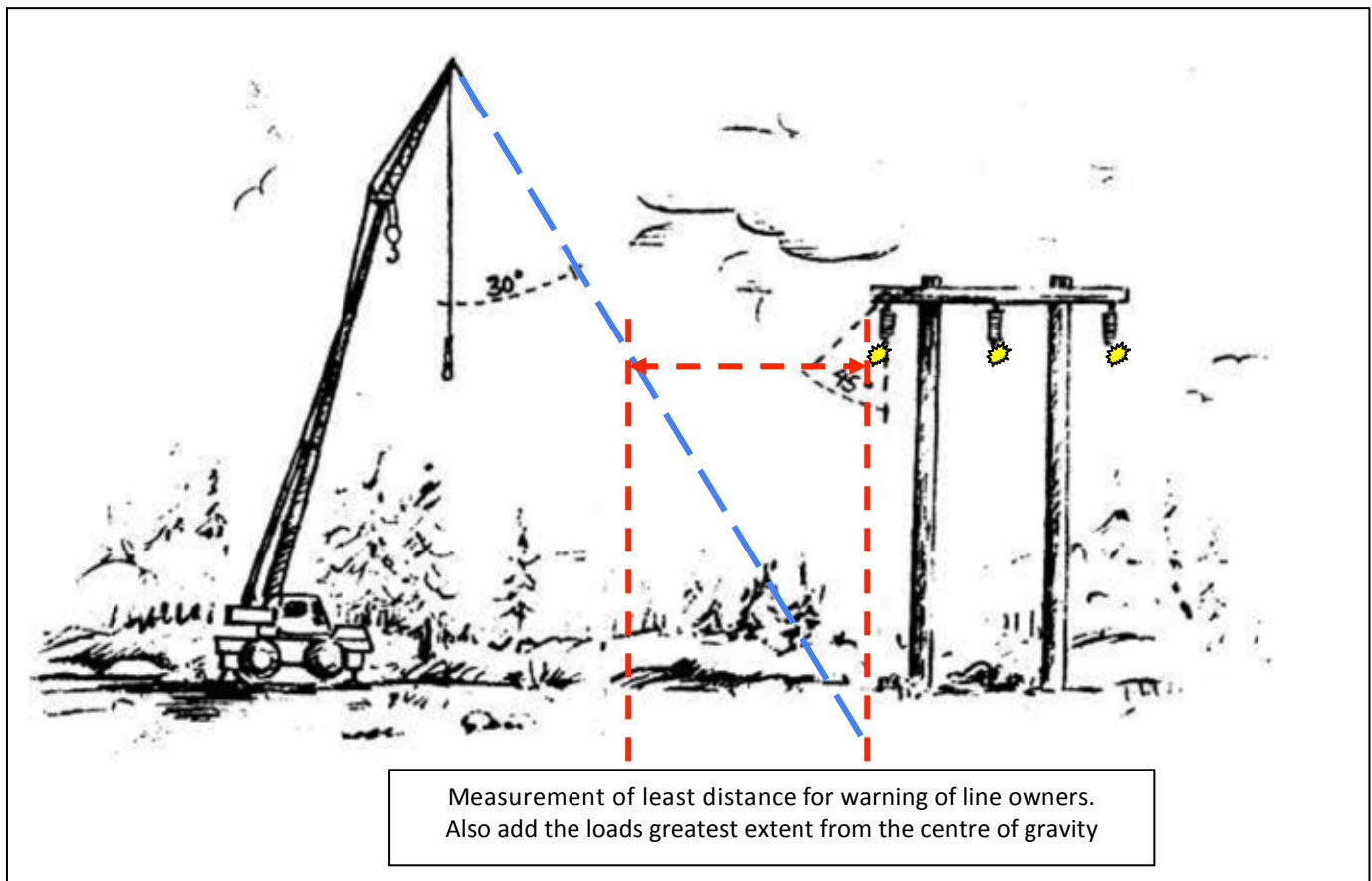
When assembling cranes close to overhead lines, the owner of the lines must be contacted if the distance is less than 30 meters for high-voltage overhead lines and 2.5 metres for low-voltage overhead lines. Consideration must be given to a 30° fluctuation in the crane's hoisting rope and the load's largest possible span from the load centre. High-voltage is considered to be voltage over 1,000 volts, which includes large power lines and railway lines. Low voltage is considered to be voltage beneath 1,000 volts and will include street lighting and residential supply. By this it is meant that whoever has responsibility for setting up a crane must check who owns the lines. This will usually be the local energy company, Statnett, the Norwegian National Rail Administration (*Jernbaneverket*) or owners of the tramways.

The owners of the lines must describe the actual rules of caution and measures for the use of cranes in proximity of their wires. Risk assessments and Safe Job Analyses will form the basis for the measures.

A usual safety measure is that the wires' owner demands one or more safety guards to take care of safety. Other safety measures may be safety disconnection, working area restrictions, earthing of the crane, guards are enabled to order emergency stops etc.

The owners of the wires have various procedures to handle this. The Norwegian National Rail Administration arranges training both for the crane drivers and those who will have safety guards, "Electrical Safety Managers", as well as being part of deciding safety measures and the need for crew.

It is important that the line owners are contacted in good time before setting up the crane so that any application deadlines and need for assistance can be clarified.









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